Faculty of Electrical Engineering & Computer Science
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Fibre Bragg gratings (FBG) in Polymer Optical Fiber.

ABSTRACT - Masterthesis

In recent years polymer optical fibers (POF) have gained increased focus in data and sensing applications. There are various advantages of POF compared to silica fibers such as low cost, higher flexibility and sensitivity thus making it an interesting candidate for fiber Bragg gratings (FBG) sensing applications used for temperature and strain sensors and in health monitoring fields. FBG sensors are advantageous compared to conventional optical sensors.

The thesis work is focused an inscribing Bragg gratings in polymer fibers and testing of the samples by optical power measurements. The block diagram briefly explains the procedure of the work. The POF is initially prepared with several cleaving techniques to get fine smooth end faces of the sample with minimum roughness. Secondly in the fiber sample a Bragg grating is generated by UV laser irradiation with a standard phase mask, side writing technique. Two types of fibers are investigated. In one case the core has a step refractive index profile and the polymer material of the core is Polymethyl methacrylate (PMMA). However due to high attenuation (60 dB/km) in infrared region and step refractive index profile, commercial PMMA fibers are restricted to low performance (<100 Mb/s) and short distance (<50 m) applications. In the final stage the sample is tested by optical power measurements with a broadband source and an optical spectrum analyser to measure the spectral characteristics after the grating has been inscribed in the fiber. The investigations are carried out for multimode polymer fibers with the core materials mentioned above.

The entire investigation is carried out at BIAS - Bremer Institut für angewandte Strahltechnik GmbH and at Hochschule Bremen Laboratory of Optoelectronics and Lightwave Technology (ELOP).